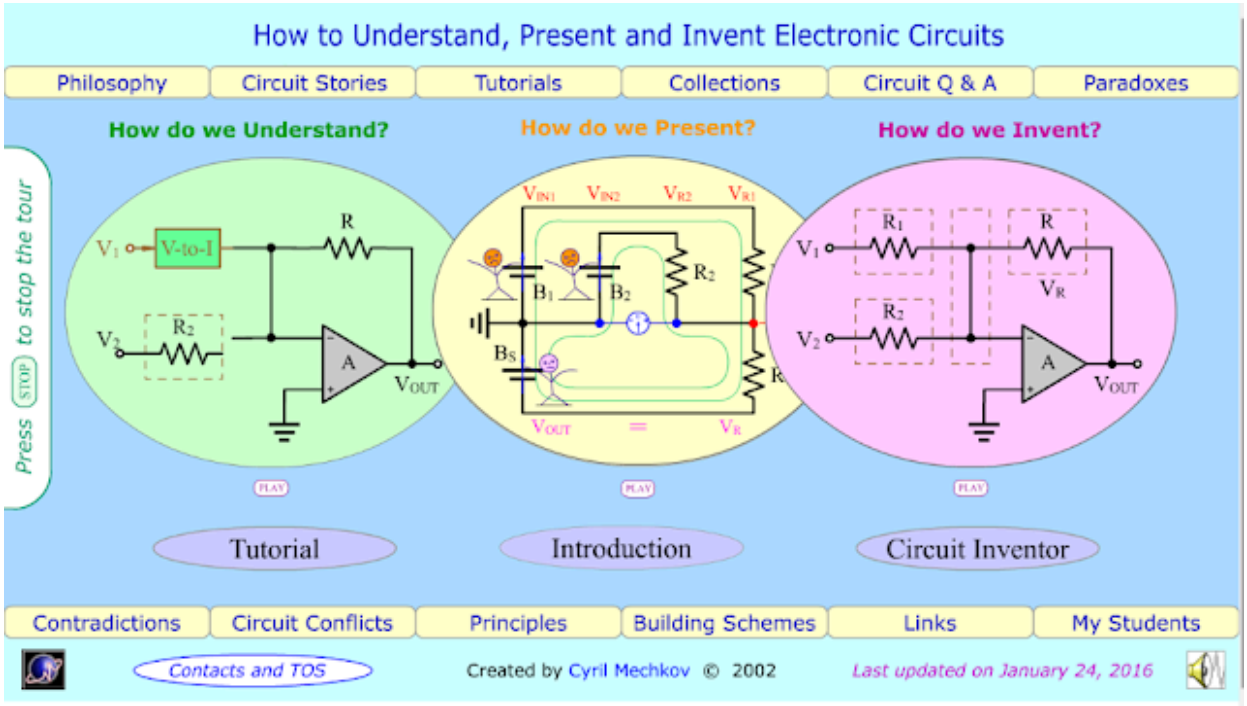
I started this interactive site in 2002. I created most of the pages by means of Macromedia Flash (now Adobe). Unfortunately, in 2021, Adobe stopped Flash Player. However, there was still a way to watch Flash movies - Ruffle Flash emulator. At the end of 2025, I closed the site after archiving and uploading it to the Internet Archive. Since not all links in it work, you can use the list of links below to navigate between the pages. Here is a link pointing to the homepage created with Flash:

How to Understand, Present and Invent Electronic Circuits

I have accompanied it with a screenshot.



Here are the links of the home page accompanied with a brief description.

Philosophy

Creation shows how I created my philosophy
Examples of inventing tells how I revealed the secret of op-amp inverting circuits in four steps
My creative evolution is an initial version of my bio (see the present full version)
Penetrations shows my great circuit insights
Papers is a list of my materials published until 2000

Circuit Stories on the Whiteboard

Understanding
What is the idea behind a constant current source?
Simple current source shortened and real loaded
Simple BJT current source
Transistor current source with shifting diode
Widlar op-amp current source
Inverting op-amp current source
Howland op-amp current source
Negative impedance converter (NIC)
Building
Op-amp ammeter
Op-amp RC integrator, roll and short
How do we build a constant current source (philosophy)?
Inventing
Passive voltage-to-current converter
Passive current-to-voltage converter
Op-amp inverting voltage-to-current converter
Op-amp inverting current-to-voltage converter
Transimpedance amplifier (current-to-voltage converter)
How do we create a virtual ground?
How do we invent constant current source?
Current biased bridge
How do We Create Dynamic Resistance?
How do We Make Decreased, Zero and Negative Differential Resistance?
How to Compensate Resistive Losses by Series Connected Negative Resistor
How to Compensate Resistive Losses by Parallel Connected Negative Resistor

Tutorials Flash

Build to understand circuits (uncompleted)
Introduction reveals the philosophy of this novel approach in electronics education

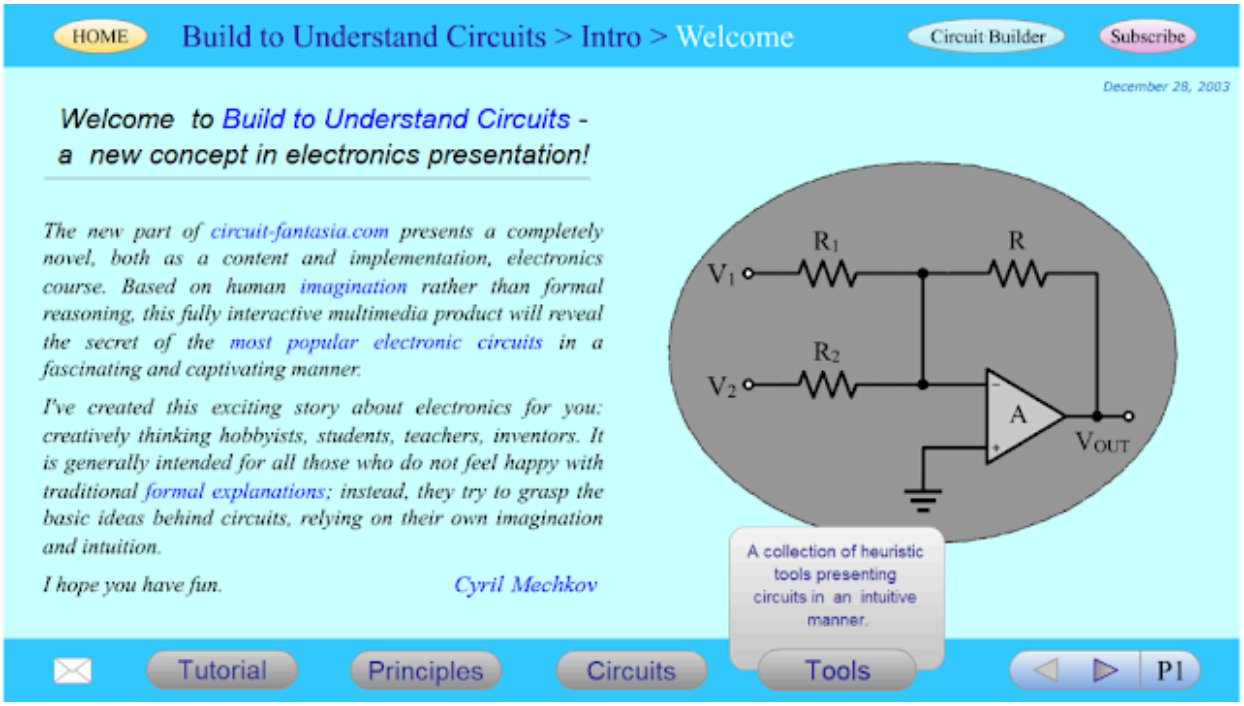
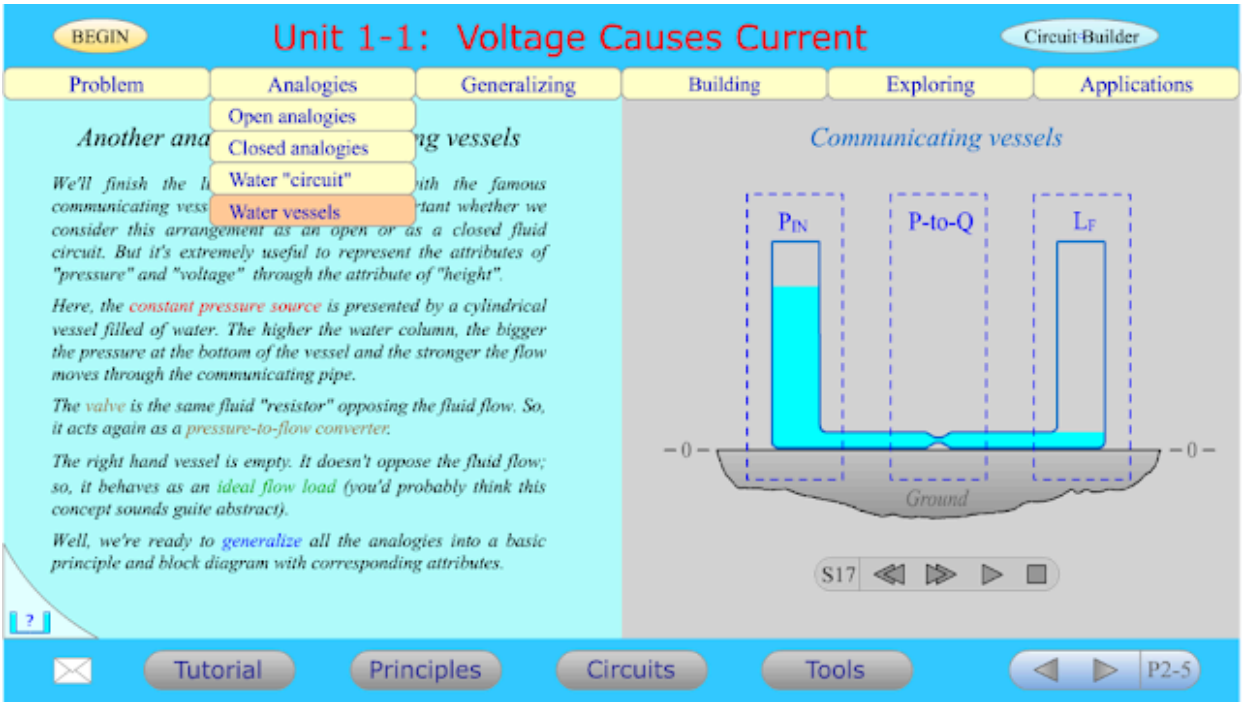
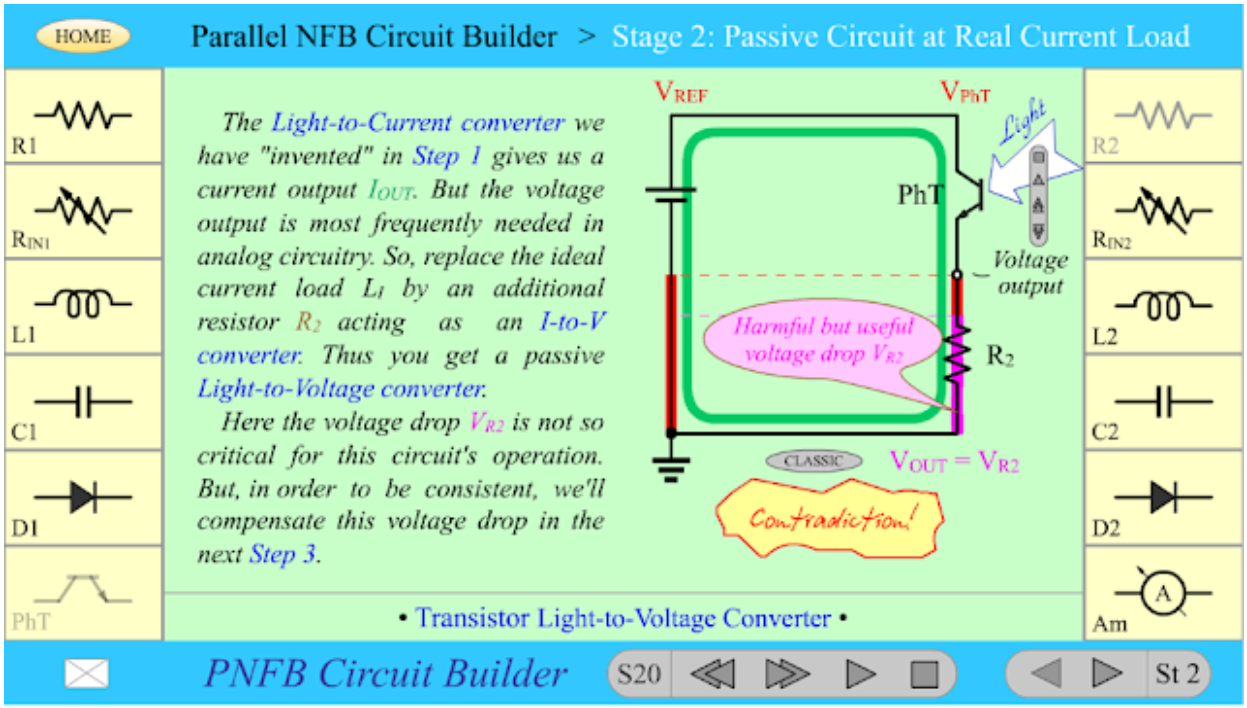

HOME
Build to Understand Circuits > Intro > Welcome
Circuit Builder
Subscribe
December 28, 2003
Welcome to Build to Understand Circuits - a new concept in electronics presentation!
The new part of circuit-fantasia.com presents a completely novel, both as a content and implementation, electronics course. Based on human imagination rather than formal reasoning, this fully interactive multimedia product will reveal the secret of the most popular electronic circuits in a fascinating and captivating manner.
I've created this exciting story about electronics for you: creatively thinking hobbyists, students, teachers, inventors. It is generally intended for all those who do not feel happy with traditional formal explanations; instead, they try to grasp the basic ideas behind circuits, relying on their own imagination and intuition.
I hope you have fun.
Cyril Mechkov
R1
R
V1
R2
V2
A
VOUT
A collection of heuristic tools presenting circuits in an intuitive manner.
Tutorial
Principles
Circuits
Tools
P1

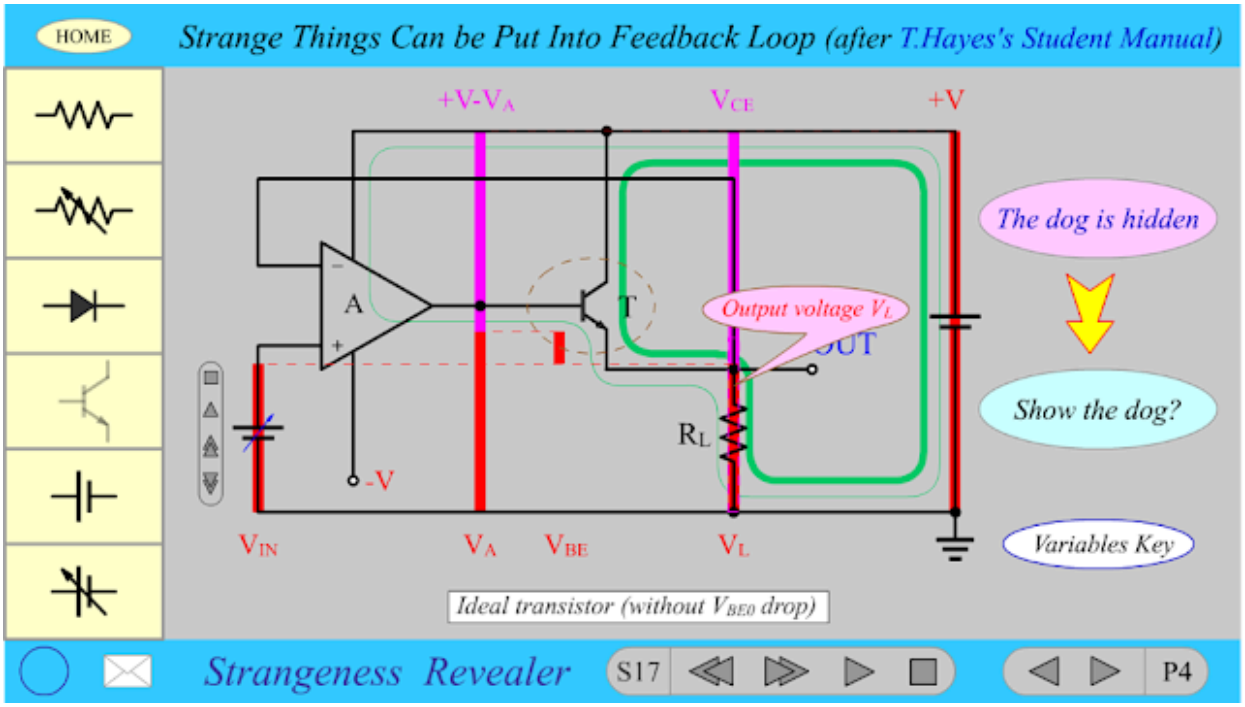
Table of contents Part 1. In the kingdom of electricity (passive circuits)
Unit 1-1 (Voltage causes current) introduces the first most elementary building blocks


BEGIN
Unit 1-1: Voltage Causes Current
Circuit Builder
Problem
Analogies
Generalizing
Building
Exploring
Applications
Open analogies
Closed analogies
Water "circuit"
Water vessels
Another ana ng vessels
We'll finish the l ith the famous communicating vess rtant whether we consider this arrangement as an open or as a closed fluid circuit. But it's extremely useful to represent the attributes of "pressure" and "voltage" through the attribute of "height".
Here, the constant pressure source is presented by a cylindrical vessel filled of water. The higher the water column, the bigger the pressure at the bottom of the vessel and the stronger the flow moves through the communicating pipe.
The valve is the same fluid "resistor" opposing the fluid flow. So, it acts again as a pressure-to-flow converter.
The right hand vessel is empty. It doesn't oppose the fluid flow; so, it behaves as an ideal flow load (you'd probably think this concept sounds quite abstract).
Well, we're ready to generalize all the analogies into a basic principle and block diagram with corresponding attributes.
Communicating vessels
PIN
P-to-Q
LF
0
0
Ground
S17
Tutorial
Principles
Circuits
Tools
P2-5

Op-amp interactive builder "builds" over 40 op-amp inverting circuits with negative feedback

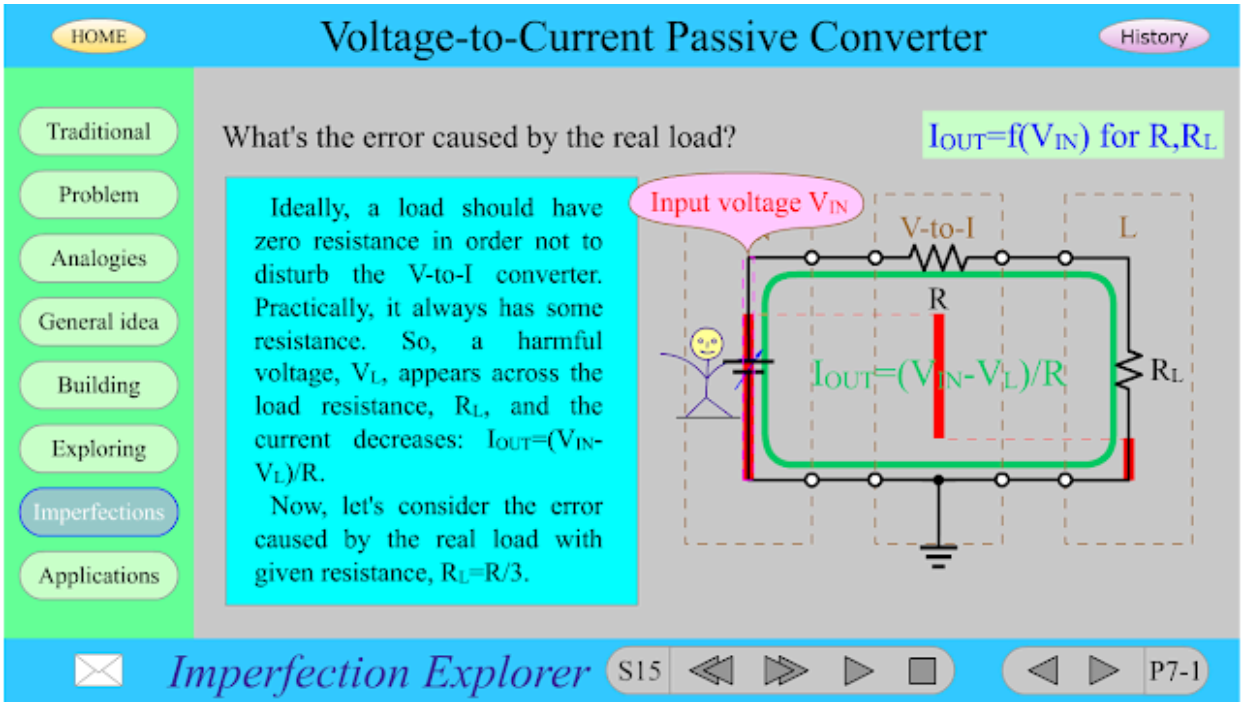

HOME
Parallel NFB Circuit Builder > Stage 2: Passive Circuit at Real Current Load
R1
RIN1
L1
C1
D1
PhT
The Light-to-Current converter we have "invented" in Step 1 gives us a current output IOUT. But the voltage output is most frequently needed in analog circuitry. So, replace the ideal current load Ll by an additional resistor R2 acting as an I-to-V converter. Thus you get a passive Light-to-Voltage converter.
Here the voltage drop VR2 is not so critical for this circuit's operation. But, in order to be consistent, we'll compensate this voltage drop in the next Step 3.
VREF
VPhT
Light
PhT
Voltage output
Harmful but useful voltage drop VR2
R2
CLASSIC
VOUT = VR2
Contradiction!
• Transistor Light-to-Voltage Converter •
R2
RIN2
L2
C2
D2
Am
PNFB Circuit Builder
S20
St 2

Strange Things can be Put in the Feedback Loop (after Tom Hayes's Student Manual) builds over a dozen op-amp circuits with a disturbance put into the feedback loop

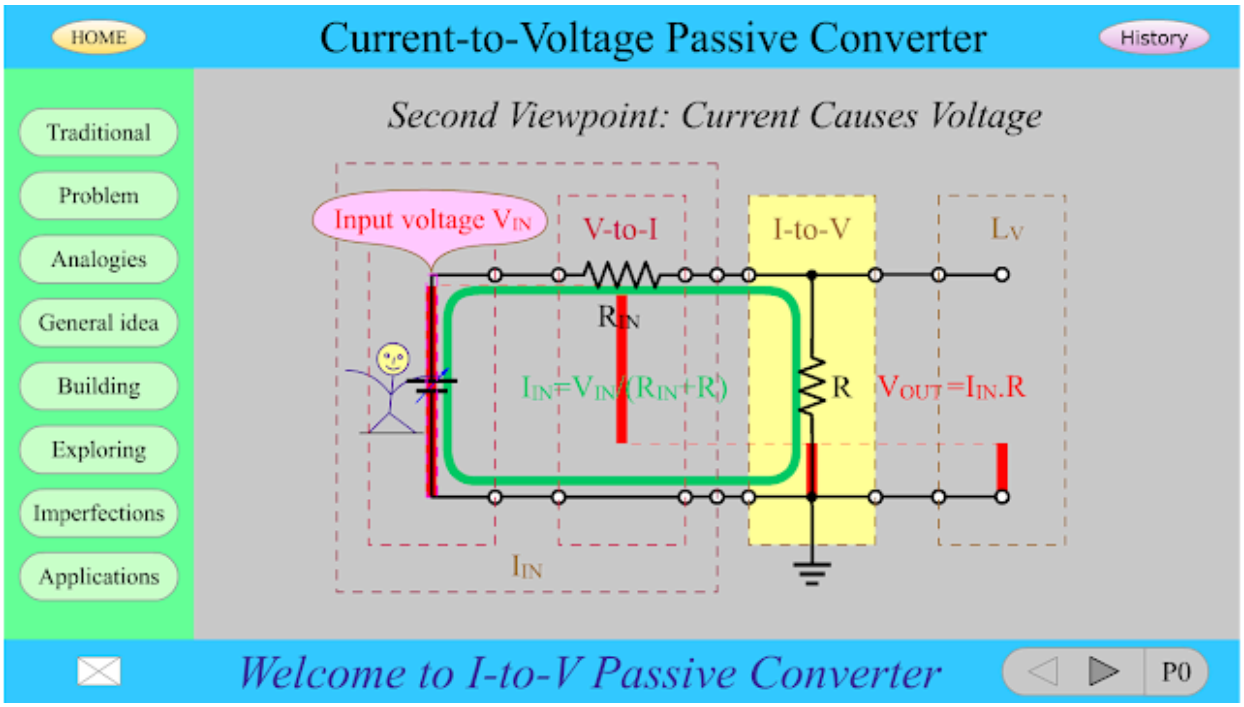


Collections

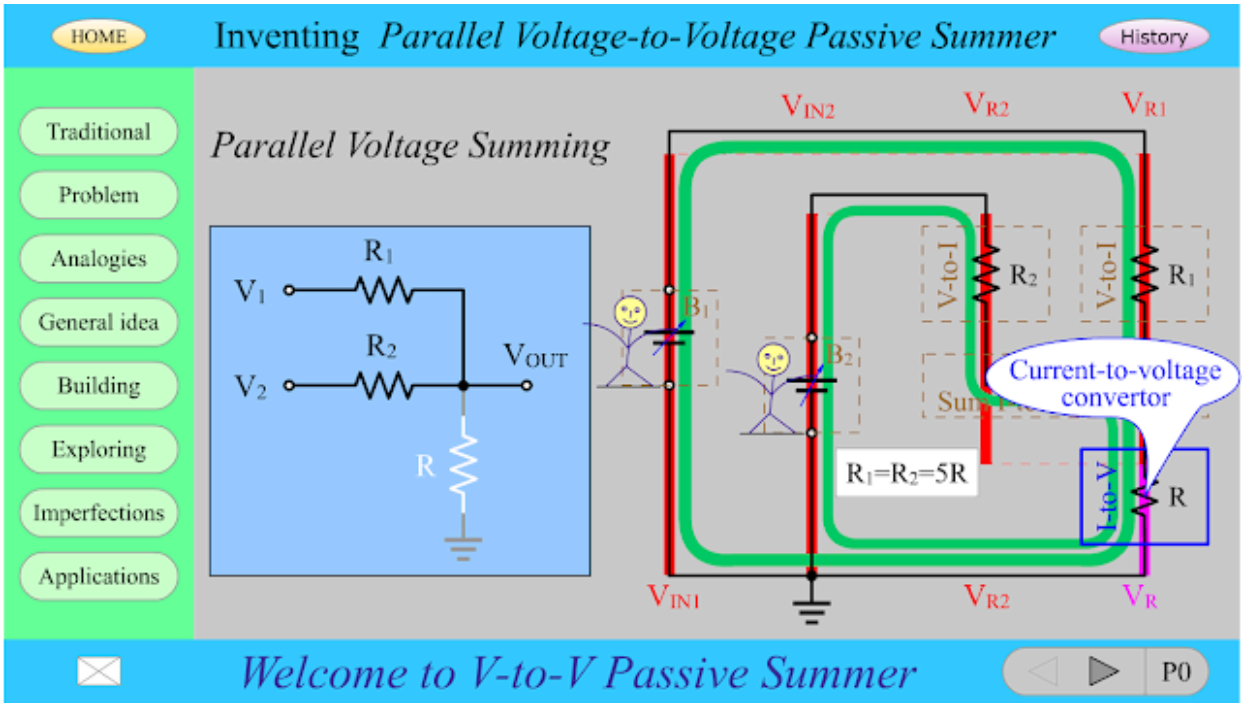
List of circuits
Circuit library
V-to-I converter builds a passive voltage-to-current converter



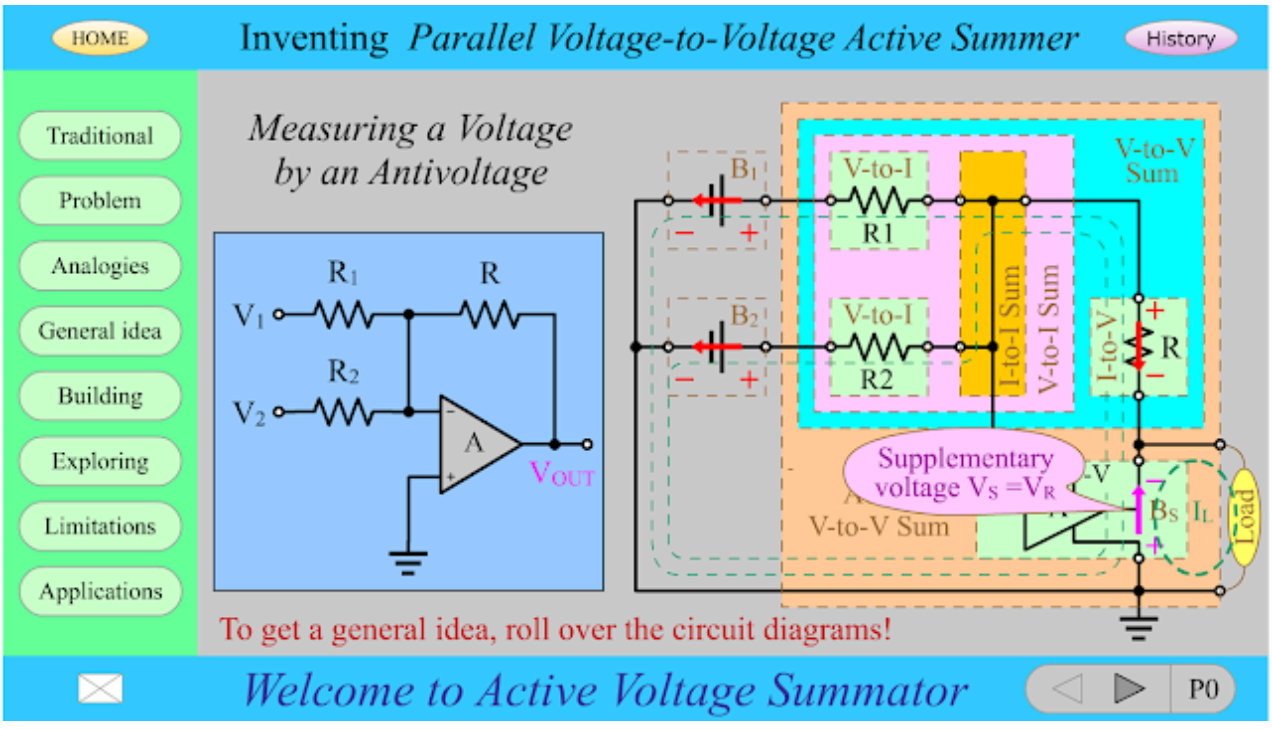
I-to-V converter creates an opposite current-to-voltage converter



Passive summer builds a compound passive resistive summer



Active summer transmutes a passive summer into an active one



Circuit Questions & Answers

Great questions contains general questions about circuits
All questions contains "ordinary" questions about circuits
Week's questions

Paradoxes of circuits is another part of the site started in September 2003 where I show the great paradoxes and absurds in electronic circuits
List of paradoxes

Contradictions

List of contradictions

Circuit Conflicts

List of conflicts

Principles

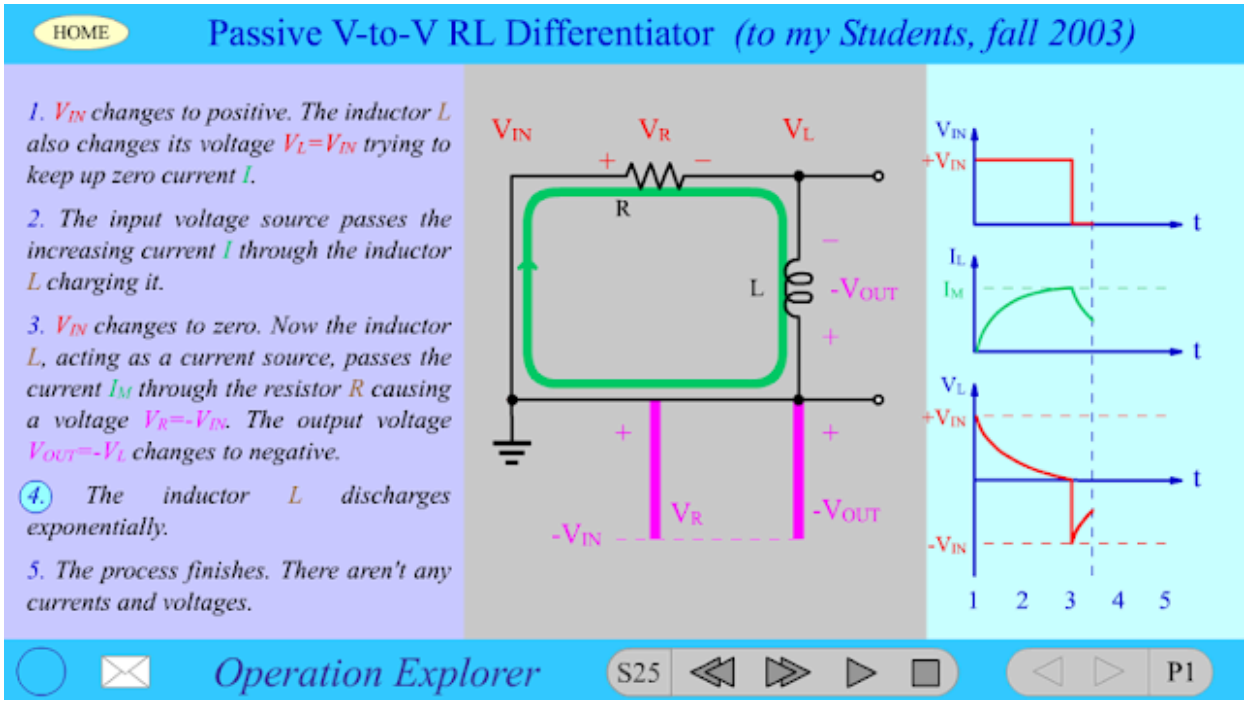
List of principles

Building schemes

List of schemes

My students (2004)

My teacher's story
Classes on Analog and mixed electronics 2004
Elementary Passive Converters with Current Output
Elementary Passive Converters with Voltage Output
Compound Passive Converters with Voltage Output
Passive Integrators and Differentiators


HOME
Passive V-to-V RL Differentiator (to my Students, fall 2003)
1. VIN changes to positive. The inductor L also changes its voltage VL=VIN trying to keep up zero current I.
2. The input voltage source passes the increasing current I through the inductor L charging it.
3. VIN changes to zero. Now the inductor L, acting as a current source, passes the current IM through the resistor R causing a voltage VR=-VIN. The output voltage VOUT=-VL changes to negative.
4. The inductor L discharges exponentially.
5. The process finishes. There aren't any currents and voltages.
VIN
VR
VL
R
L
-VOUT
-VIN
IL
IM
t
1 2 3 4 5
Operation Explorer
S25
P1

[Diode Circuits]
[Transistor Circuits without Feedback]
[Transistor Circuits with Feedback]
[Op-amp Amplifiers with Negative Feedback]
[Op-amp Converters with Parallel Negative Feedback]
[Op-amp Circuits with Positive Feedback]
[Components and Sub-systems for Analog-Digital Signal Processing]

[Fedback from readers]